

Release notes for ENDF/B Development n-091\_Pa\_230  
evaluation



April 26, 2017

- fudge-4.0 Warnings:

1. Cross section does not match sum of linked reaction cross sections  
*crossSectionSum label 0: total (Error # 0): CS Sum.*

**WARNING: Cross section does not match sum of linked reaction cross sections! Max diff: 0.37%**

2. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

*Section 1 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [nubar]): / Form 'eval': (Error # 0): Condition num.*

**WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small**

3. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

*Section 3 (total): / Form 'eval': / Component 0 (Error # 0): Condition num.*

**WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small**

4. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

*Section 3 (total): / Form 'eval': / Component 1 (Error # 0): Condition num.*

**WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small**

5. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

*Section 4 (n + Pa230): / Form 'eval': / Component 0 (Error # 0): Condition num.*

**WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small**

6. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

*Section 4 (n + Pa230): / Form 'eval': / Component 1 (Error # 0): Condition num.*

**WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small**

7. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

*Section 8 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission]): / Form 'eval': / Component 0 (Error # 0): Condition num.*

**WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small**

8. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

*Section 8 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission]): / Form 'eval': / Component 1 (Error # 0): Condition num.*

**WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small**

9. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 10 ( $n + (Pa230\_e1 \rightarrow Pa230 + \gamma)$ ): / Form 'eval': (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (4.548010e-09) is too small

10. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 11 ( $n + (Pa230\_c \rightarrow Pa230 + \gamma)$ ): / Form 'eval': (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

11. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 12 ( $\gamma + Pa231$ ): / Form 'eval': / Component 0 (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

12. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 12 ( $\gamma + Pa231$ ): / Form 'eval': / Component 1 (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

13. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 13 ( $n + Pa230$  [angular distribution]): / Form 'eval': (Error # 1): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

14. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 14 ( $n[multiplicity:energyDependent, emissionMode:prompt] + n[emissionMode:delayed]$ ) +  $\gamma$  [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

15. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 15 ( $n[multiplicity:energyDependent, emissionMode:prompt] + n[emissionMode:delayed]$ ) +  $\gamma$  [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

16. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 16 ( $n[multiplicity:energyDependent, emissionMode:prompt] + n[emissionMode:delayed]$ ) +  $\gamma$  [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

17. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 17 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

- fudge-4.0 Errors:

1. Energy range of data set does not match cross section range  
*reaction label 2: n + (Pa230\_c -> Pa230 + gamma) / Product: Pa230\_c / Decay product: gamma\_a / Multiplicity: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (170000.0 -> 20000000.0) vs (110967.0 -> 20000000.0)

2. Energy range of data set does not match cross section range  
*reaction label 2: n + (Pa230\_c -> Pa230 + gamma) / Product: Pa230\_c / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (170000.0 -> 20000000.0) vs (110967.0 -> 20000000.0)

3. Calculated and tabulated Q values disagree.  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma (Error # 0): Q mismatch*

WARNING: Calculated and tabulated Q-values disagree: -6202217.958648682 eV vs -5794780. eV!

4. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_a / Multiplicity: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6000000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)

5. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_a / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6000000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)

6. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_b / Multiplicity: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)

7. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_b / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)

8. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_c / Multiplicity: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)

9. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_c / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)

10. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_d / Multiplicity: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)

11. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_d / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)

12. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_e / Multiplicity: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6000000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)

13. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_e / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6000000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)

14. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_f / Multiplicity: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)

15. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_f / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)

16. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_g / Multiplicity: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)

17. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_g / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)

18. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_h / Multiplicity: (Error # 0): Domain mismatch (a)*
- WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)
19. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_h / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)*
- WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)
20. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_i / Multiplicity: (Error # 0): Domain mismatch (a)*
- WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)
21. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_i / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)*
- WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)
22. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_j / Multiplicity: (Error # 0): Domain mismatch (a)*
- WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)
23. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_j / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)*
- WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)
24. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_k / Multiplicity: (Error # 0): Domain mismatch (a)*
- WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)
25. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_k / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)*
- WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)
26. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_l / Multiplicity: (Error # 0): Domain mismatch (a)*
- WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)

27. Energy range of data set does not match cross section range  
*reaction label 3: n[multiplicity:'2'] + Pa229 + gamma / Product: gamma\_l / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5820190.0 -> 20000000.0)

28. Calculated and tabulated Q values disagree.  
*reaction label 4: n[multiplicity:'3'] + Pa228 + gamma (Error # 0): Q mismatch*

WARNING: Calculated and tabulated Q-values disagree: -13299735.67599487 eV vs -1.28923e7 eV!

29. Calculated and tabulated Q values disagree.  
*reaction label 5: n[multiplicity:'4'] + Pa227 + gamma (Error # 0): Q mismatch*

WARNING: Calculated and tabulated Q-values disagree: -19278634.30172729 eV vs -1.88712e7 eV!

30. Calculated and tabulated Q values disagree.  
*reaction label 7: Pa231 + gamma (Error # 0): Q mismatch*

WARNING: Calculated and tabulated Q-values disagree: 6412665.440002441 eV vs 6.8201e6 eV!

31. Multiplicity does not match sum of linked product multiplicities!  
*multiplicitySum label 4: n + (Pa230\_c ->Pa230 + gamma) total gamma multiplicity (Error # 0): summedMultiplicityMismatch*

WARNING: Multiplicity does not match sum of linked product multiplicities! Max diff: 28.82%

32. Multiplicity does not match sum of linked product multiplicities!  
*multiplicitySum label 5: n[multiplicity:'2'] + Pa229 + gamma total gamma multiplicity (Error # 0): summedMultiplicityMismatch*

WARNING: Multiplicity does not match sum of linked product multiplicities! Max diff: 75.54%

33. Calculated and tabulated Q values disagree.  
*fissionComponent label 0: /reactionSuite/fissionComponents/fissionComponent[@label='0'] (Error # 0): Q mismatch*

WARNING: Calculated and tabulated Q-values disagree: 215214963242.7122 eV vs 1.862099e8 eV!

34. Calculated and tabulated Q values disagree.  
*fissionComponent label 1: /reactionSuite/fissionComponents/fissionComponent[@label='1'] (Error # 0): Q mismatch*

WARNING: Calculated and tabulated Q-values disagree: 215214963242.7122 eV vs 1.862099e8 eV!

35. Calculated and tabulated Q values disagree.  
*fissionComponent label 2: /reactionSuite/fissionComponents/fissionComponent[@label='2'] (Error # 0): Q mismatch*

WARNING: Calculated and tabulated Q-values disagree: 215214963242.7122 eV vs 1.862099e8 eV!

36. Calculated and tabulated Q values disagree.  
*fissionComponent label 3: /reactionSuite/fissionComponents/fissionComponent[@label='3'] (Error # 0): Q mismatch*

```
WARNING: Calculated and tabulated Q-values disagree: 215214963242.7122 eV vs 1.862099e8 eV!
```

37. A covariance matrix was not positive semi-definite, so it has negative eigenvalues.  
*Section 13 (n + Pa230 [angular distribution]): / Form 'eval': / LegendreLValue L=1 vs 1 (Error # 0): Bad evs*

```
WARNING: 11 negative eigenvalues! Worst case = -1.264353e-04
```

- njoy2012   Warnings:

1. Evaluation has no resonance parameters given  
*unresr...calculation of unresolved resonance cross sections (0): No RR*

```
---message from unresr---mat 9128 has no resonance parameters
copy as is to nout
```

2. In some evaluations, the partial fission reactions MT=19, 20, 21, and 38 are given in File 3, but no corresponding distributions are given. In these cases, it is assumed that MT=18 should be used for the fission neutron distributions.  
*heatr...prompt kerma (0): HEATR/hinit (3)*

```
---message from hinit---mt19 has no spectrum
mt18 spectrum will be used.
```

3. Recoil is not given, so one-particle recoil approximation used.  
*heatr...prompt kerma (1): HEATR/hinit (4)*

```
---message from hinit---mf6, mt 16 does not give recoil za= 91229
one-particle recoil approx. used.
```

4. Recoil is not given, so one-particle recoil approximation used.  
*heatr...prompt kerma (2): HEATR/hinit (4)*

```
---message from hinit---mf6, mt 17 does not give recoil za= 91228
one-particle recoil approx. used.
```

5. Recoil is not given, so one-particle recoil approximation used.  
*heatr...prompt kerma (3): HEATR/hinit (4)*

```
---message from hinit---mf6, mt 37 does not give recoil za= 91227
one-particle recoil approx. used.
```

6. Recoil is not given, so one-particle recoil approximation used.  
*heatr...prompt kerma (4): HEATR/hinit (4)*

```
---message from hinit---mf6, mt 51 does not give recoil za= 91230
one-particle recoil approx. used.
```

7. Recoil is not given, so one-particle recoil approximation used.  
*heatr...prompt kerma (5): HEATR/hinit (4)*

```
---message from hinit---mf6, mt 91 does not give recoil za= 91230
one-particle recoil approx. used.
```

8. Recoil is not given, so one-particle recoil approximation used.  
*heatr...prompt kerma (6): HEATR/hinit (4)*

```
---message from hinit---mf6, mt102 does not give recoil za= 91231
      photon momentum recoil used.
```

9. There is a problem with the fission energy release.  
*heatr...prompt kerma (11): HEATR/nheat (3)*

```
---message from nheat---changed q from 1.862099E+08 to 1.773524E+08
      for mt 18
```

10. Evaluation has no resonance parameters given  
*purr...probabalistic unresolved calculation (0): No RR*

```
---message from purr---mat 9128 has no resonance parameters
      copy as is to nout
```

11. Coefficient mismatch of some sort  
*covr...process covariance data (1): COVR/matshd (2)*

```
---message from matshd---processing of mat/mt 9128/ 4 vs. mat1/mt1 9128/ 91
      largest coefficient= 1.10684E+00 at index 435 365
```

12. The number of coefficients is too big.  
*covr...process covariance data (2): COVR/matshd (3)*

```
---message from matshd--- 83 coefficients > 1
      reset and continue.
```

13. The number of coefficients is too big.  
*covr...process covariance data (3): COVR/matshd (3)*

```
---message from matshd--- 40 coefficients > 2
      reset and continue
```